

PATHWAYS

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No. 1

SOLVING MATHS PROBLEMS—3

Following A Checklist

In many jobs there are important procedures to follow. To be successful, it is important to do each step and in the right order. Because following the order is important, workers often use checklists. Pilots, for example, use a checklist when taking off or landing. The checklist helps them to be sure everything is done correctly from beginning to end.

When you have to solve problems, a checklist will give you an orderly way to approach every problem. The checklist will help to keep to keep your thinking on track. The checklist will give you confidence. It will help you to solve the problems by making you think about:

- what you have to find out,
- what data will help you to find it,
- how you will use the data,
- whether or not your solution is right.

You already know four good steps to put at the top of a problem-solving checklist. Remember the code word RILL?

1. Read it carefully
2. Imagine a picture of the problem

3. Look for the unknown

4. Look for useful data

Here are five more steps you should put on your problem-solving checklist.

5. Put The Problem in Your Own words

You can put what you think is most important at the beginning or the end as you want. You can leave out details that you're sure won't affect the answer.

Use RILL to decode the problem below. Think how you would say the problem in your own words. Then do the activity below the problem. After you've done the activity, solve the problem and write down your answer.

Problem: At a fancy dress party there were 5 clowns, 4 pandas, 7 robots, and 2 monsters. How many more robots were there than clowns?

Activity: Circle the best rewording of the problem. Be ready to tell why.

1. Five clowns, 7 robots, 4 pandas, and 2 monsters went to a party. How many fewer clowns were there than robots?

2. There were 3 clowns, 4 pandas, 7 robots, and 2 monsters at a party. I have to find the difference between the number of robots and clowns.

3. If there were 7 robots and 5 clowns at a party. How many more robots than clowns were there?

Problem: Some 7-legged creatures, each with 3 heads, visited our classroom 5 days in a row. Each day 4 different 7-legged creatures visited. How many visitors were there in all?

Activity: Write your own rewording of the problem.

6. Look For A Problem-solving Strategy

You have to figure out how you're going to find what is unknown. You have to choose a strategy.

Often, choosing a strategy will be easy. You'll see that you have to add, subtract, multiply, or divide. Sometimes you may have to do two or more operations.

Use the first five checklist steps to decode the problems below. After each problem, put the sign of the math operation you will use as a strategy to solve the problem in the brackets.

Problem: Bharat packs 6 fruit in each tin. With 42 fruits, how many tins can Bharat pack? ()

Problem: Rita packs 6 fruits in each tin. She has 7 tins to fill. How many fruits will she need? ()

7. See If You're On The Right Track

When you think you're ready to solve a problem—stop! Review your first six steps. See if everything makes sense. If you're sure you're on the right track—go ahead.

8. Put Your Answer In A Sentence

Got an answer to the problem? Don't stop there. Now it's time to check the answer to see if it relates to the data and the unknown in the

problem. There's one good way to do that—put your answer in a sentence. Use a sentence that includes important words from the problem. Making a good sentence is a way to check your thinking about the problem.

Look at the sentence below. Fill in the numbers needed. The sentences are complete answers to the last two problems you did. Compare your own sentences with the ones below.

1. With 42 fruits, Bharat can pack _____ tins of 6 fruit each,

2. To fill 7 tins with 6 fruit each, Rita needs _____ fruits.

9. Look for Ways To Prove You're Right

When you can prove your answer to a problem, you feel confident that you're right. Look for ways to prove you're right. For example, suppose you subtracted 59 paise from Re 1. You say your answer is 41 paise. You can prove it by putting the 41 p and the 59 p together. Added together, they equal Re 1.

Study the proofs below. They prove some of the problems you've done.

1. 4 visitors + 4 visitors is 8 visitors + 4 visitors is 12 visitors + 4 visitors is 16 visitors + 4 visitors is 20 visitors.

2. I can compare 5 C's with 7 R's and see there are 2 more R's.

C C C C C
R R R R R R R

3. I can lay out 42 ●'s in groups of 6. I find 7 groups of ●'s.

●●●●●● ●●●●●● ●●●●●● ●●●●●●
●●●●●● ●●●●●● ●●●●●●

Here is the final checklist.

1. Read it carefully.
2. Imagine a picture.
3. Look for the unknown.
4. Look for data.
5. Put it in your own words.
6. Find a strategy.
7. Check and do it.
8. Turn your answer into a sentence.
9. Prove you are right.

Obviously, giving young children of the primary school a long checklist of this kind is futile. For the teacher the best classroom strategy is to internalize these steps, then deliberately and consciously use them as you work out problems with your students. Let them see and hear you follow the checklist several times. Ask the questions aloud. Explain your mental

processing before putting an answer on the blackboard. Gradually you will be able to train them to use a systematic procedure of this kind. The number of problems with incorrect answers or improper working will decline. Both you and your students will get great satisfaction from proving you are right!

RIDDLE- ME- REE— FOR TEACHERS OF GEOGRAPHY

1. There are those who think that it is flat
Though most think it is round.
To be closer still it is tangerine-shaped
And on it you can be drowned!
What is it?
2. Spare, if you will, a thought for Edwina
Proud
Who now strums a harp on a heavenly cloud.
She died, at peace, on a recent Monday
But was laid in her grave on the PREVIOUS
Sunday!

No crime or error attended this act,
So can you explain the incredible fact
That the lady died at half-past four
And then was buried the day before?!
3. First, it runs through field and town,
Never goes up, always goes down.
Then lifts and falls for many a day
'Till it climbs to the sky, up, up and away.
It floats on high and puts on weight
Then falls once more at quite a rate.
When hot it's thin; when cold it's hard,
So what is the subject of this bard?

Answer on page 4

LEAF ZOO

by Shri Arvind Gupta;
26 pages; Rs. 10/-;
published by the NCSTC
under its
"Do It Yourself"
series for children.

The 23 illustrations in this book show how a child can create a variety of animal pictures using leaves of common trees and flowering plants. It encourages keen observation of the plant life in the environment, creativity and self-expression. Order copies from the Accounts Officer, Vigyan Prasar, DST, Technology Bhavan, New Delhi-110 016. Orders should be accompanied by a Demand Draft in favour of VIGYAN PRASAR, payable at the Union Bank of India Safdarjung Development Area Branch, New Delhi-110 016. Add mailing charges: Rs. 2/- for Book-post; Rs. 5/- for Ordinary Post and and Rs. 6/- for registration per packet.

Other books from the NCSTC were reviewed in the November 1991 issue of PATHWAYS. Several sets of slides with bilingual (Hindi/English) scripts have also been prepared. To find out more about these, write to the NCSTC and also ask them to send you their monthly Newsletter—COMMUNICATIONS.

MAKE A PEANUT PUPPET

Material:

- White glue
- Three ice-cream sticks
- Darning needle
- Peanuts in their shells
- Poster/powder paint
- Heavy thread
- Yarn

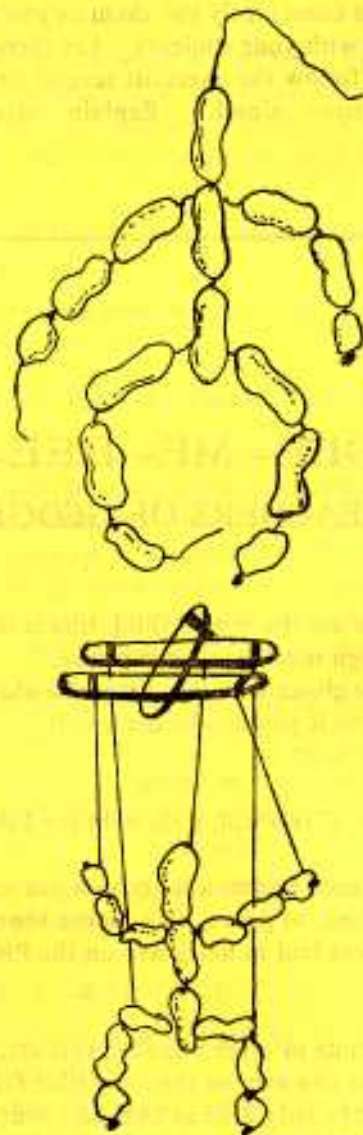
String together three long peanuts to make the head and body. Use the darning needle and a long piece of thread for this. You may have to twist the needle to get it through the shell. Leave a long tail of thread above the puppet's head. Tie big knots at the top and bottom of the three nuts to prevent them from slipping.

String together small and long peanuts as shown to make the arms and legs. As earlier, large knots will prevent the peanuts from slipping off. Paint on the face and clothes and use glue to fix small pieces of yarn for the hair. Take care that the top string is left loose.

Make a control stick by gluing the three ice-cream sticks together. Attach control threads as shown. Tie knots at the end of each thread so that they do not slip off. Note that the hands are tied to the front crosspiece and the legs to the back one. The head is tied to the centre control stick.

Dab a little glue to the sticks at the points where the threads are tied, to keep them from slipping off.

Hold the control stick with one hand and pull the control strings with the other to make the puppet move.



RIDDLE- ME- REE

Answers:

1. The Earth
2. Just after she had suffered a fatal heart attack, Edwina's body was transported on a plane and crossed the International Date Line. Upon which Monday changed back to Sunday.
3. Water

LINKING LITERATURE AND OTHER CONTENT AREAS OF THE CURRICULUM

Topics in literature overlap those in almost all subject areas—social studies, science, health, mathematics, music and art. That fact has long been noted, but we often overlook the importance of another connection. Literature is a key to help students unlock the complexities of text structure in other subjects. They can understand how the whole text is organized, how the parts are related and how the message is delivered.

Informational non-fiction is often organized by patterns of logic. A stated main idea is accompanied by supporting evidence, or the evidence may be presented alone, leaving readers to infer the main idea. There are, of course, other patterns of logic; other text structures for informational non-fiction.

Some kinds of non-fiction (a biography, a description of how things work) and nearly all works of fiction are organized by time sequence. For most young readers, a text structure made up of a sequence of events is easiest to follow. However, young readers may still have some difficulty. Connections, including cause—effect or effect—cause may evade them, or they may have trouble clustering events to arrive at a generalization.

Patterns such as these are used in content-area text books, reference materials—and in literature; but the clarity and consistency of such patterns of text structure are most evident in literature.

Literature provides students with excellent models of text structure. When students are guided in their reading of these models, they become better able to tackle the structures of textbooks and other content materials. These are usually more mixed in structure and almost always loaded with more information within a limited space than most works of fiction. Hence literature bridges the way to understanding them.

Writers of literature will shape a sentence to a point. Effectively, they entice young readers to explore a wide variety of sentence structures. They also choose their words with care—for accurate meaning, for the right shade of meaning, to fit the context, for correct connotation, rhythm, and sound. Such qualities, should not be confined to language classes alone. They are essential to communication, especially to the writing and reading in the content areas.

What can the language teacher do to teach these aspects of text: text structure, sentence structure, and diction?

1. Provide good literary models showing structure and word choice at their best.

2. Provide good models of text processing. "Think out loud" to show students how a skilled reader skims the title and content of a piece of informational writing to discover its purpose and organization. Show diagramming techniques—diagrams of the content within the selected pieces. Read rich but possibly unfamiliar sentences aloud to students and, at times, ask them to echo the reading to "get the taste" of new structures and terms.

3. Give special attention to activities that teach students about text structure.

4. When selecting or creating exercises on your own look for literature related to content-area topics.

Facts, generalizations and ideas from social studies are seen more clearly against a tapestry of literature. You might like to collaborate with the social studies teacher just before he/she begins new unit. Introduce students to the illustrated folklore of a continent to be studied, easy and exciting biographies, historical fiction that says "you are there", modern fiction that affords a visit to a distant place. A social studies

text reference to a famous historical figure, a crucial incident, or an intriguing custom can and should motivate a search for literature that tells more. Interest is the prime reason for allying literature with the social studies. Social studies topics begin with the students' environment but soon extend to "expanding communities", increasingly distanced from readers' immediate experience. This is as it should be: Education should expand one's horizons. Readers can discover basic problems of living that human beings have struggled with from earliest times.

What can literature add to science content? First, literature supports a sense of wonder. It helps us explore the world through the eyes of gifted authors and illustrators. Second, literature fosters an appreciation of accuracy and a quest for accuracy. Word connotations and precise detail in literature sharpen the reader's perceptions. Third, literature helps us synthesize experiences. It may show, for example, how ingenuity confronts natural disaster or how human survival may be based on understanding and using the natural environment.

At one time there was concern that non-scientific literature might actually harm a child's development of science concepts. Hens, pigs, and spiders do not really talk—but in literature they sometimes do! Such concern has abated. Children, even at an early school age, are apparently able to see the distinction between "real" and "make-believe" or to note the distinction when their teachers help them do so. Fanciful nonscientific stories are just the right contrast for arousing interest in finding out how it really is—hence the desire for scientific investigation. By the same logic, science fiction—even when it presents a future world that may not come true—inspires hypothesis-making and substantiated conjectures that are rooted in science.

There is a wealth of informational literature devoted to science itself. Teachers can investigate the accuracy and coverage of informational science selections taken from magazines and newspapers.

Some children have trouble seeing the connection between story problems in the arith-

metic book and the story problems of real life. One study showed the superior results in mathematics problem-solving when children made their own "math stories" based on their own needs. Perhaps these "math stories" could even be made from the situations and characters children meet in literature, for these stories, too may add both context and interest to mathematical problems. Literature also offers selections with more direct application to mathematics, ranging from simple counting rhymes to complicated literary mathematical puzzles.

The possibilities are wide and challenging when it comes to incorporating literature into the health curriculum. They include direct use of new informational materials on nutrition, safety, and health maintenance. Encourage students to pursue health-related topics further in their reading.

The visual arts offer teachers and students a great variety of activities: drawing and painting, paper cutting, sculpting and modelling, construction and printmaking. Any one of these can stir the students' imaginations and provide them with a visual means of responding to literature.

Several art activities can be planned to enhance a literary experience. Their selection can be guided by class discussions of a particular selection. For example, if the discussion focuses on the setting, then students might sketch the setting or visualize it through collage. As they reread a description of a setting in a story or a poem, urge students to develop a mental image. Then using pencil, crayon, pastel or charcoal, they can sketch quickly on paper the scene in their imaginations. Later, they may add details and finish the scene with paint, water color or chalk.

Characters in literature may also fire the imagination. Following a discussion of a main character's traits, invite students to model that character from clay. Encourage them to represent what the character was like and the impression that character made on the readers rather than how the character looked. Finished clay figures, dried or baked in a kiln, can be

displayed against a painted or constructed background of the story's setting.

Encourage group projects like a mural or a large map of a "journey" story, labelling each place and major event in the story. Students could make an accordion book by the following method: the class identifies the main events in the story; each student sketches one of the events; the sketches are arranged in order and then connected by loose stitching or metal rings. The result is a visual display of the story sequence.

Collages and mobiles can help students respond to literature holistically. A collage is a combination of textures (cloth, foil, small flat objects) and cut-out images (news photos, parts of magazine ads, and so on) arranged on a flat surface. Its effect is to mirror and augment the tone and mood of stories and poems.

A mobile is also a combination of items, but now the pieces (pictures, objects) are suspended by string or wire, and balanced so that they seem to hang in the air, turning so that the viewer sees a constantly shifting pattern. Try a mobile made of folk characters and objects important in folk tales. Use this mobile as an introduction to "folk-tale trivia". Bring it out from time to time and ask students to identify each item and the folk tale from which it came.

The rhythms and sounds of words have their counterparts in the rhythms and sounds of music. One study shows that listening to soft

classical background music during reading aids comprehension. With guidance, children can see that the music has created impressions through rhythms and changing tempo.

Poems with strong rhythms or pleasant-sounding lines can inspire song making. To create songs from poems, have students read a poem several times to bring out the rhythm, phrasing, and mood. Use choral speaking techniques to do this. Then have them investigate beat and sample melodies, progressing line by line through the poem. When the final song version is put together, tape the melody or quickly notate it above a written version of the poem.

Musical instruments can be used to create sounds that will heighten the mood for oral reading or any performance of literature. A "signature tune" for instance, may announce the entrance of each character in the telling of a folk tale. Such tunes can be composed on a homemade xylophone or a recorder (flute). To stress the rhythm in a poem, use rhythm sticks, various types of drums, sand blocks, and maracas. The use of musical instruments may also help establish the setting of a story or a play.

Actively exploring the links between language, literature and other subjects implies being aware of what the student is required to study in various subject areas. Meetings between the teachers concerned and joint planning can help make such a programme successful.

The Indira Gandhi National Open University has started its B.Sc. programme from November this year. This programme is specially designed for distance learners, who, for one reason or another, cannot take advantage of full time campus education. The programme is modular in nature offering a wide variety of courses from the four basic disciplines of science, viz. Physics, Chemistry, Life Sciences and Mathematics. Laboratory training is an essential component of the programme. The entry qualification for this programme is 10+2 or its equivalent with science subjects. The minimum period in which one can earn the degree is three years. However students can pace their studies and finish the programme in upto eight years. Because of this flexibility of time, the programme is ideal for working people. For primary school teachers keen to improve their qualifications and competence, this provides an ideal opportunity. Instruction is imparted through a multi-media learning package available in English as well as Hindi. Regular tutoring is available through a network of 29 study centres throughout the country, having audiovisual and library facilities. Admissions are notified in all newspapers in April-May each year.

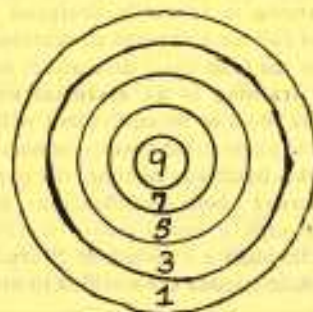
A MATHEMATICAL CALENDAR

This time, instead of an activity, I would like to share with readers a collection of problems which their maths club students could solve, one on each day of the month. Encourage them to look for short-cut methods. Answers will appear in the next issue of Pathways.

Saroja Sundararajan

MARCH 1992

1. The sum of 5 consecutive integers is 210. What are the integers?
2. A 6-digit number of the form $a2b308$ is divisible by 33. Find all possible solutions.
3. What is the largest amount of money you can have in coins and still not be able to give change for a rupee.
4. The ends of three match sticks can be glued together to form an equilateral triangle. Can you form seven equilateral triangles using only 9 matches?
5. Ram is seventeen times as old as his brother was when Ram was as old as his brother is. Their father is not yet 90 years old. How old are Ram and his brother?
6. If a rectangle were 2 metres wider and 3 metres longer, the area would be more by 50 m^2 . If it were 3 metres wider and 2 metres longer, then the area would be 52 square metres more. What are the dimensions of the rectangle?
7. Make the number 500, by mathematically combining eight 4's.
8. If a figure is made up of 12 unit squares, where these are connected, having at least one side in common, what would be the maximum and minimum perimeter of such figure?
9. An isosceles triangle ABC has sides $AB=BC=169$ units. Side $AC=130$ units. What is the height AE from the vertex A to side BC?
10. Substitute a different digit for each letter to make the following statement true.
$$\begin{array}{r} \text{H A L F} \\ + \text{H A L F} \\ \hline \text{W H O L E} \end{array}$$
11. Find the number of terms in the following sequence:
 $49, 56, 63, \dots, x$
12. Find five weights totalling 121 kilos that are needed to make all integral weighings from 1 to 121 kilos using an accurate two pan balance.
13. What is the probability of having four boys and four girls in a family of eight children?
14. Kamal threw six darts and all six hit the targets shown in some order. Which of the following is his score?
 $4, 17, 56, 28, 29, 31$



15. I'm a two-digit number. I'm one less than a multiple of 8 and three less than a multiple of seven. What two numbers could I be?
16. In a triangle with sides 4, 5 and 6, the measures of the angles opposite the sides of 6 and 4 have an interesting relationship with each other. Determine this relationship and prove your assertion.
17. Evaluate this continued fraction
- $$\frac{2+1}{3+1 \frac{2+1}{2+1 \frac{2+1}{3}}}$$
- How can you change it equal to $31/24$?
18. This sides of an equiangular hexagon measure 10, 6, 12, 14, x and y units, in the order given. Find x and y.
19. A dear old grandpa named Munn
It twice as old as his son.
Twenty five years ago
Their age ratio
Strange enough was three to one!
How old are grandpa Munn and his son?
20. If the perimeter of an isosceles right triangle is 2 m, what is its area in terms of m?
21. What is probability that the arrangement of the word **ides** will be **dies**?
22. If X represents a digit and $X_4 = 4 X_4$, what is the number in base 10?
23. What is larger in value? 2^{30} or 3^{20} ?
24. A square and a circle have the same area. Find the ratio of the diagonal of the square to the radius of the circle.
25. In a 5-12-13 right triangle, what is the length of the bisector of the larger acute angle?
26. Arrange the following in increasing numerical order,
 $a=2^{25}$; $b=3^{44}$; $c=5^{33}$; $d=6^{22}$
27. If p is a prime number greater than 5, what is the sum of the positive integral factors of 5 p.
28. Find the smallest value of n for which k is a positive integer when
 $3^n - 1 = 11k$
29. Half a number plus two-thirds of it is 42. What is the number?
30. Find the sum of the reciprocals of all the factors of 24.
31. Can you cut a regular octagon from a square piece of paper without using compasses or ruler or anything but scissors. You can fold the paper so as to make creases.

A school is not a military camp but rather a garden where every child is to be nurtured with love and encouraged to grow to his fullest. We cannot expect that every flower should be exactly alike. All we can do is water the garden, manure it and provide the sunshine of our love.

THE EGG IN THE BOTTLE

Students of the upper primary and middle school classes learn several facts about air pressure. Some teachers manage, in spite of pressures of time and other constraints to demonstrate simple activities showing the effects of air pressure. However, when it comes to testing, most of us end up asking the usual theoretical questions and correcting answers which have been memorised from text books or notes. Here is a somewhat different kind of a test. You can carry out a simple demonstration in front of the class. Thereafter, older children can be asked to write down an explanation of why the egg slipped into the bottle. Younger ones can be given the set of questions listed here to check how well they have grasped the concepts.

The experiment may also be tried out with a slightly peeled banana instead of the egg. As it slips into the mouth of the bottle, the banana gets peeled. Why?

Materials: A milk bottle, a peeled hard-boiled egg, some paper, matches. (If a milk bottle is not available, find some other suitable wide-mouthed bottle, into which the egg will go. Likewise, for the banana experiment, you may need a bottle with a narrower mouth. It would be wise to try out this experiment at least once on your own before the demonstration.)

Drop some lighted paper into the bottle and place the hard boiled egg on it as shown. Watch what happens.

Questions:

Mark with a tick (\checkmark), those sentences which are true. After you have done that, re-arrange those sentences in the correct order and write out an explanation which tells you why the egg slipped the bottle.

1. The burning paper goes out after some time.
2. The bottle is empty.
3. The air in the bottle contains oxygen.
4. The paper needs oxygen for burning.
5. The bottle contains air.
6. The paper will go on burning for a long time.
7. The paper burns as long as there is oxygen in the bottle.
8. The atmosphere outside the bottle exerts pressure on the egg.
9. When the paper stops burning, some of the air inside the bottle has been used up.
10. The air pressure inside the bottle is more than before.
11. The air pressure inside the bottle is less than before.
12. The pressure of the atmosphere is less than the air pressure inside the bottle.
13. The pressure of the atmosphere is more than the air pressure inside the bottle.
14. This pushes the egg into the bottle.

Here is one possible sequence for the correct answers: 5, 3, 4, 1, 7, 9, 11, 8, 13, 14.

Note that the children may vary this sequence slightly when they write their explanation of the experiment. It is important for the teacher to figure out whether or not they have achieved a correct understanding of the physical processes involved.

As an extension you might like to ask the children why a peeled hard-boiled egg was used rather than a raw whole egg. They might like to try the experiment on their own at home using the banana. Caution them to have an adult nearby, as they have to handle burning paper.

Gayatri Moorthy



THE STRANGE 'CASE' OF VINOD

(Pages from a Teacher's Diary)

April 20

I'm just beginning to get to know all the children in my class, the VI. They are 43 in all and attaching names to faces to personalities to individual needs will take a while. Especially the quieter ones. Vinod is certainly not one of those. From day one he has been doing everything he can to make his presence seen and felt. He's already got me to acknowledge him as his name and face were the first to come together for me.

April 30

Vinod's behaviour in class borders on being disruptive. In the middle of something I'm saying he'll come up to me and say something absolutely way out. What does he want? If he paid attention in class and could find ways of getting my response, we could both be creative. But when he takes my attention completely away from the rest of the class, I just don't know what to do.

May 10

Today's class was quite disastrous. The onus lies somewhere with the way I handled Vinod. We were making up stories in groups of four. Vinod's group complained quite soon that he wasn't "co-operating". I went over to the group and pulled up a chair. For a while Vinod worked quietly. Then he started fooling around. He pulled away Nishant's pencil, then started nudging Savitri and making faces at her.

Firmness, I thought. I told Vinod to stop disturbing the others and if he wasn't interested he could do whatever else he liked. He shot out of his chair and went to the door, out of it, and started swinging on it.

I lost my patience and told him to stand in the corner. The glee with which he had been

swinging, fled from his face. He stood there, mournfully looking at everyone, looking wronged.

July 10

School re-opened today and Vinod's back looking as hyper-energetic as ever. He pre-occupies my thoughts even when his behaviour isn't remarkably different from that of the others. Hope this term goes well with him.

July 20

Something's bothering Vinod. He doesn't seem interested in anything I do with the class. There's no way in which I can catch his attention; no activity, no game, no song with which to establish a mode of communication. He just does his own thing, which mostly involves throwing things at his classmates, talking incessantly to his partner, or taking my attention away from everyone else.

August 4

I was eager to meet Vinod's parents today but neither of them came for the parents' meeting. Nishant's mother complained that he doesn't manage to pay attention in class because Vinod constantly talks to him. She wants me to change Nishant's seat.

What makes Vinod click?

August 19

Table-tennis is really spreading like a viral infection and most of my children have caught it. There aren't enough tables in the basement, so they asked me if they could play in class. (I remember how in 10th standard we used to play in class between periods, in the break and in every free minute.) Still, hesitatingly, I told

them they could, provided they wond up their game the moment the teachers arrived. I think it's a really good outlet for all that energy! Vinod was one of the more vocal petitioners. Perhaps I'll manage to reach him now, through table tennis?!

August 22

Why doesn't anything work with Vinod? Today I walked into a completely chaotic class. Everyone was in some way involved with various games of table-tennis. All the games broke up immediately, except the one on between Vinod and Nishant. I waited for them to finish up. Waited for 10 minutes! Yes, I timed them. And they completely ignored me. Nishant seemed a bit uneasy, as did many of the other children, but Vinod was oblivious or pretended to be so.

Finally I ended up in sheer exasperation, banning table-tennis in class. Used the teacher's veto-ing power and hated myself for it.

September 15

The results of the unit tests are coming in. A lot of the children have not scored enough marks in the various subjects. There seems to be a direct correlation between enthusiasm for table-tennis and low grades. It beats all logic.

Vinod has flunked in every subject. All the other teachers have sent letters to his parents and are eager to meet them, perhaps to drill it into them that he needs some special inputs.

September 21

Vinod's parents didn't come to collect his unit test report. When I asked him why, he said that they were too busy. He brought a letter which requested me to send the report through him. The academic supervisor says I must meet the parents, so I've posted a letter to them.

October 1

Meeting Vinod's father was an experience of a lifetime. My first response to him was that

of unease, extreme discomfort which defies description or logic. A while after we started talking I realized how scared he was. Vinod's elder sister was expelled from this school three years ago—Ayeshwarya had flunked two years consecutively. And Vinod's father was scared that he too would be expelled. "Do something for him, ma'am", he pleaded. "He really looks up to you".

That surprised me completely. I've never realised that Vinod feels a bond with me. Perhaps I have managed to reach him in some way?

October 19

Today felt like a breakthrough in many ways. I went to class, consciously feeling like reaching out to Vinod.

He was waiting outside the door, as he often does. The immediate launching into gaining my attention by him made it easier for me to reach out. For the first few minutes, while the others were taking their places, I talked to him. Asked him what he felt like doing, shared with him what I had planned for that class and asked if he felt interested. He happily went and sat at his desk. Then a few minutes after I gave out the worksheets, he came up to me and told me he couldn't do it. I asked him to sit at my table and we went over the first couple of exercises together. After that I roamed about in class, helping students individually. Vinod quietly sat and worked, calling me after finishing each exercise, and going over them with me.

When the period was over, I left feeling good, and noticed, just how happy and thrilled he looked.

October 20

All that Vinod ever needed from me, from all of us, is love. He needs lots of it. For some reason, he doesn't seem to be getting enough of it. I must've been blind not to have seen this before. His baby talking or pretending that I belonged only to him, or disrupting classes.

Child psychology say "ignore negative behaviour and reinforce the positive actions". But that proved to be inadequate here. Perhaps my responding positively to him right from the start would've made all the difference.

How hurt he looked everytime I told him that he was distracting and disturbing everyone! Because he didn't mean to either distract or disturb anyone. He was only asking to be loved. Can I, in some way acknowledge that, without making him dependent on me?

November 20

Becoming aware of what he needed has helped me to see Vinod's behaviour from a kinder perspective. In my classes he tries to work now, because he's beginning to feel secure about my love for him.

Complaints do come in from other teachers and one teacher has been sending after letter to his parents. I'm getting tired of filing copies of these stinkers.

December 20

It was another D Day for Vinod. The second set of unit tests are over and he's flunked every subject except mine. Teachers are beginning to mark him out as one of those who will be "detained" in the VI in the next academic session.

January 29

We live in autocratic times. I was asked today to sign a letter to his parents informing them that if Vinod didn't "show improvement" by the end of the year, they would be asked to "withdraw him" from the school. Preposterous, I said. The academic Supervisor told me there was nothing I could do about it, the decision had already been taken. But what role do I play then, despite being his class teacher, I asked. It doesn't really matter whether you sign it or not, the case has been decided upon already, she replied. In that case I shall not, in protest, I told her and left her room. In the last period the Principal's P.A. told me that the Big Man wanted to meet me early tomorrow morning before assembly. Oh well!!

—Anubha Bannerjee

THE RIGHTS OF THE CHILD

These are the rights of your child—do you violate them? Think about it.

1. The right to be loved—unconditionally.
2. The right to be heard—with attention.
3. The right to play—every day and in his/her own way.
4. The right to move and speak—freely.
5. The right to make mistakes—often.
6. The right to be forgiven—easily.
7. The right to be different—from other children.
8. The right to ask questions as often as he/she please.
9. The right to experiment and explore.

[Framed and adopted by S. P. M. English School, Pune and reprinted from their 91-92 calendar.]

MATHEMATICS THROUGH ORIGAMI

The art of making decorative items by folding paper is known as 'origami'. If one wants to understand the mathematical laws followed by nature, it is said, one should learn and practice 'origami'. Make a fish, a bird, or a kangaroo out of paper and you will realise that the folds follow a mathematical rule.

The Japanese art of 'origami' is inexpensive and a fascinating way of teaching children about geometry and other areas of mathematics. Some months ago, the Educational Planning Group was able to organise a special three day pro-

gramme on 'origami' for Mathematics teachers in Delhi. This programme was conducted by Dr. Ravindra Keskar, Associate Professor of St. Xavier's Institute of Technology, Bombay. We are delighted to learn that Dr. Keskar, now on a two-year leave from his institution, is conducting a series of programmes all over India under the auspices of the National Council for Science and Technology Communication. For the benefit of readers of Pathways we reproduce the schedule of these programmes from the *NCSTC Communications*.

| | | | |
|------------------|----------------|---|--|
| Madhya Pradesh | March 1992 | 2 workshops (Special workshops for Adult Education Teachers) | Dr. Hina Sen Disha, Post Box 130 Biladi Bada, Handi Para Raipur-492001 (MP) |
| Delhi | April 1992 | Training workshop | Dr. (Smt.) Madhu Pant Director Bal Bhavan Society India Kotia Road, New Delhi-2 |
| Madhya Pradesh | May 1992 | Repeat workshop | Gwalior Science Centre MIG-70 Darpan Colony Gwalior |
| Uttar Pradesh | June 1992 | Training workshops (three) | S & T Council U.P. B-144 Sector-C, Mahanagar Lucknow-226006 |
| Andhra Pradesh | July 3-5, 1992 | Training workshop | Shri K. Suresh Bal Sahiti 2-1-1/5, Nalla Kunta Hyderabad |
| Karnataka | August 1992 | Training | Dr. Lalit Kishore Indo Tibetan Sch. Orgn. USO House JNU Instt. Area New Delhi-110067 |
| Karnataka | August 1992 | Training workshop | Belgaum Science Centre Belgaum (Karnataka) |
| Himachal Pradesh | September 1992 | Repeat workshop | Dr. S. K. Dhawan State Council for S&T and Environment Indira Bhavan Shimla-170001 |
| Punjab | October 1992 | Training workshop | Dr. Neelam Gulati Punjab State S&T Council SCO 2935-36, Sector 22-C Chandigarh-160022 |

Other organizations if interested in the activity, may get in touch with the contact person(s) indicated above, or write to Dr. (Mrs) Madhu Phull at NCSTC, Technology Bhavan, New Delhi-110016.

How Well Do You Know Your Children?

By Judy Bailey

Teachers are parents too! How well do you know your children? There may be many crucial things you don't know about them. Answer these questions for each of your children. It is a way of learning more about your family. Perhaps when you find time to sit with each of them to seek the answers, you will be in for many more surprises.

1. Who is your child's best friend?
2. What colour would he/she like his/her room to be?
3. Who is your child's greatest hero?
4. What embarrasses him/her most?
5. What is his/her biggest fear?
6. What is his/her favourite kind of music?
7. What person outside the family has most influenced your child's life?
8. What are his/her favourite and least favourite subjects in school?
9. Of what accomplishment is your child proudest?
10. What is your child's biggest complaint about the family?
11. What sport does your child most enjoy?
12. If you could buy your child anything in the world, what would be his/her first choice?
13. Who is your child's favourite teacher?
14. What really makes your child angry?
15. Does your child feel liked by the children at school?
16. What would your child like to be when he/she grows up?
17. What has been the biggest disappointment in your child's life this year?
18. Does your child feel too small or too big for his/her age?
19. What gift from you does your child cherish most?
20. What non-school book has your child most recently read?
21. What is his/her favourite family occasion?
22. What foods does your child like and dislike most?
23. What nicknames is your child called in school?
24. When does your child prefer to do homework: right after school, after dinner, before bed or in the morning before school?
25. What is your child's most prized possession?

25—20 You listen well to your children. Keep up the good work.

20—14 You know quite a bit about your child, but you need to fine-tune your listening.

14—0 You don't communicate as much as you should. Begin talking more. Listening more.

[Reprinted from the Reader's Digest, November 1983.]

MOISTURE MAKERS

Transpiration is the evaporation of water from plant surfaces, primarily the leaves, into the air. Most plants transpire approximately 75% of the water taken in by the roots, through the small openings (*Stomata*) found on the leaf and stem surfaces. The stomata regulate transpiration by opening and closing. Fluctuations in transpiration occur seasonally and depend on environmental factors such as wind, light, moisture, temperature.

Here is a way of setting up a variety of pupil experiments to study this process. First prepare cobalt chloride paper by soaking small pieces (2 cm x 5 cm) of filter paper (or any other absorbent paper) in a solution of cobalt chloride. This can be easily made by dissolving two teaspoons of cobalt chloride (available from your chemistry laboratory) and one teaspoon of salt in four teaspoons of water. Dry out the paper by hanging it up with clothesclips. When dry it will be blue in colour. When moist it turns pink.

Place a small piece of clear cellotape on either side of a small area of one piece of treated paper. This portion will remain blue, and the colour change (if any) in the remaining sections will be easily visible. Cobalt chloride paper may be fixed on to leaves using paper clips. The paper and the leaf should be wrapped in a plastic bag. (Why?). Allow 5-15 minutes for the colour change.

Here is a variety of simple experiments which students can carry out.

1. Compare the time it takes different leaves to turn the paper pink.
2. Compare transpiration of a dead leaf with a live leaf attached to the same tree.
3. Compare transpiration of a thick juicy leaf (succulent) with a flat thin leaf.

(Reprinted from Pathways August 1983 Issue.)

4. Compare transpiration of a hairy-surfaced leaf with a smooth surfaced leaf.

5. Compare transpiration of a leaf in the shade with a leaf of the same tree which is the same size and shape-but is in the sun.

6. Compare the transpiration of a small and a large leaf on the same plant.

7. Compare the transpiration of a stem with a leaf on the same plant.

8. Compare the transpiration of a thin leaf (like a pine needle) with a broad leaf.

9. Older students could set up experiments to assess the effects of excessive watering on transpiration. Choose two plants of the same kind and approximately the same size. Label the plants A and B. Water plant A the day before and also just before measuring the rate of transpiration. Do not water plant B. Compare the results obtained on both plants.

10. Another exercise could involve students in checking on the rate of transpiration at different times of the day.

11. Potted plants in metal or plastic containers with no drainage holes could help in another experiment. The plants are watered only once. Their soils are covered with foil or plastic sheet to prevent water loss due to evaporation. Then plants and their containers are weighed.

An identical pot containing soil and water is set up as a control. Instead of a plant, it contains only a wooden stick. The soil surface in the control pot is also covered and it is weighed.

The potted plants and the control are weighed every other day. The difference in weight loss between the control and experimental pots is the water lost through transpiration. □